WHAT IS CLAIMED IS:

1. A method for managing traffic in a packet-based switch/router that has an input interface for receiving traffic on multiple virtual circuits (VCs) and an output interface for transmitting traffic on multiple VCs, said method comprising:

classifying packets into traffic classes;

associating said packets with a VC;

on a per-VC basis, enqueuing said packets into class-specific queues; and

on a per-VC basis, dequeuing said packets from said class-specific queues.

2. The method of claim 1 wherein dequeuing said packets from said class-specific queues includes dequeuing said packets from said class-specific queues as a function of traffic class.

3. The method of claim 2 wherein classifying said packets includes reading header information from said packets, said packets being variable-length packets.

4. The method of claim 2 wherein dequeuing said packets from said class-specific queues includes dequeuing said packets according to a weighted fair algorithm.

5. The method of claim 2 wherein dequeuing said packets from said class-specific queues includes dequeuing said packets according to a strict priority algorithm.

6. The method of claim 2 wherein dequeuing said packets from said class-specific queues includes dequeuing said packets according to a weighted fair with strict priority algorithm.

7. The method of claim 1 further including:

enqueuing said packets that are dequeued from said class-specific queues into VC-specific segmentation and re-assembly (SAR) queues; and

dequeuing said packets from said VC-specific SAR queues according to a dequeuing algorithm that arbitrates among multiple VC-specific SAR queues.

8. The method of claim 7 further including segmenting, into fixed-length cells, said packets that are dequeued from said VC-specific SAR queues.

9. The method of claim 8 further including transmitting said fixed-length cells from said output interface on a VC.

10. The method of claim 9 further including transmitting said fixed-length cells in the order that the respective packets are dequeued from said VC-specific SAR queues.

11. The method of claim 1 wherein said packets are variable-length packets.

12. The method of claim 11 wherein classifying said variable-length packets includes reading header information from said variable-length packets.

13. The method of claim 12 wherein classifying said variable-length packets includes reading layer 3 and layer 4 header information from said variable-length packets.

14. The method of claim 11 further including:

enqueuing said dequeued variable-length packets into VC-specific SAR queues;

dequeuing said variable-length packets from said VC-specific SAR queues according to a dequeuing algorithm that arbitrates among multiple VC-specific SAR queues;

segmenting, into fixed-length cells, said variable-length packets that are dequeued from said VC-specific SAR queues; and

transmitting said fixed-length cells from said output.

15. The method of claim 1 further including:

receiving said packets into said switch/router as fixed-length asynchronous transfer mode (ATM) cells;

re-assembling said packets from said fixed-length ATM cells;

enqueuing said dequeued packets into VC-specific SAR queues;

dequeuing said packets from said VC-specific SAR queues according to a dequeuing algorithm that arbitrates among multiple VC-specific SAR queues;

segmenting, into fixed-length cells, said packets that are dequeued from said VC-specific SAR queues; and

transmitting said fixed-length cells from said output.

16. The method of claim 15 further including transmitting packets from said switch/router on the same VC that said packets were received at said switch/router.

17. A method for managing traffic in a packet-based switch/router that has an input interface for receiving traffic on multiple virtual circuits (VCs) and an output interface for transmitting traffic on multiple VCs, said method comprising:

receiving fixed-length cells;

re-assembling variable-length packets from said fixed-length cells;

classifying said variable-length packets into traffic classes;

associating said variable-length packets with a VC;

on a per-VC basis, enqueuing said variable-length packets directly into a VC-specific segmentation and re-assembly (SAR) queue if there is queue space available in said VC-specific SAR queue; and

on a per-VC basis, enqueuing said variable-length packets into class-specific queues if there is not queue space available in the respective VC-specific SAR queue.

18. The method of claim 17 wherein said variable-length packets are enqueued directly into a VC-specific SAR queue if there is queue space available in said VC-specific SAR queue and if there are no packets in the respective class-specific queues.

19. The method of claim 17 further including, on a per-VC basis, dropping packets if there is no queue space available in said VC-specific SAR queue or in the respective class-specific queues.

20. The method of claim 17 wherein classifying variable-length packets includes classifying said variable-length packets based on information in the headers of said variable-length packets.

21. The method of claim 17 wherein classifying said variable-length packets includes reading layer 3 and layer 4 header information from said variable-length packets.

22. The method of claim 17 further including:

receiving said fixed-length cells as fixed-length ATM cells;

re-assembling said variable-length packets from said fixed-length ATM cells;

dequeuing variable-length packets from said VC-specific SAR queues according to a dequeuing algorithm that arbitrates among multiple VC-specific SAR queues;

segmenting, into fixed-length ATM cells, said variable-length packets that are dequeued from said VC-specific SAR queues; and

transmitting said fixed-length ATM cells from said output.

23. The method of claim 17 further including, on a per-VC basis, dequeuing packets from said class-specific queues to the respective VC-specific SAR queues as a function of traffic class when there is queue space available in the respective VC-specific SAR queues.

24. The method of claim 23 wherein dequeuing said packets from said class-specific queues includes dequeuing said packets according to a weighted fair algorithm.

25. The method of claim 23 wherein dequeuing said packets from said class-specific queues includes dequeuing said packets according to a strict priority algorithm.

26. The method of claim 23 wherein dequeuing said packets from said class-specific queues includes dequeuing said packets according to a weighted fair with strict priority algorithm.

27. A packet-based switch/router comprising:

an input interface for receiving traffic on multiple virtual circuits (VCs);

an output interface for transmitting traffic on multiple VCs;

a packet classifier for classifying packets into traffic classes based on packet header information;

a demultiplexer for associating packets with a VC;

VC-specific and class-specific queues;

VC-specific segmentation and re-assembly (SAR) queues;

an enqueue module for enqueuing packets by traffic class into said VC-specific and class-specific queues;

a dequeue module for dequeuing packets from said VC-specific and class-specific queues to said VC-specific SAR queues.

28. The packet-based switch/router of claim 27 further including a quality of service (QoS)/SAR module for dequeuing packets from said VC-specific SAR queues.

29. The packet-based switch/router of claim 28 wherein said QoS/SAR module segments dequeued variable-length packets into fixed-length cells for transmission on a VC.

30. The packet-based switch/router of claim 28 wherein said QoS/SAR module arbitrates among multiple VC-specific SAR queues.

31. The packet-based switch/router of claim 27 wherein said dequeue module dequeues packets from said VC-specific and class-specific queues as a function of traffic class.

32. The packet-based switch/router of claim 31 wherein said dequeue module dequeues packets from said VC-specific and class-specific queues according to a weighted fair algorithm.

33. The packet-based switch/router of claim 31 wherein said dequeue module dequeues packets from said VC-specific and class-specific queues according to a strict priority algorithm.

34. The packet-based switch/router of claim 31 wherein said dequeue module dequeues packets from said VC-specific and class-specific queues according to a weighted fair with strict priority algorithm.

35. The packet-based switch/router of claim 27 wherein said packet classifier reads header information from said packets to classify said packets.

36. The packet-based switch/router of claim 27 wherein said packet classifier reads layer 3 and layer 4 header information from said packets to classify said packets.

37. A packet-based switch/router comprising:

an input interface for receiving traffic on multiple virtual circuits (VCs);

an output interface for transmitting traffic on multiple VCs;

a packet classifier for classifying received packets into traffic classes based on packet header information;

a demultiplexer for associating packets with a VC;

means for enqueuing packets into VC-specific and class-specific queues;

means for dequeuing packets from said VC-specific and class-specific queues into VC-specific segmentation and re-assembly (SAR) queues.

38. The packet-based switch/router of claim 37 further including means for dequeuing packets from said VC-specific SAR queues for segmentation into fixed-length cells.

39. The packet-based switch/router of claim 37 wherein said means for dequeuing includes means for dequeuing packets from said VC-specific and class-specific queues as a function of traffic class.

40. The packet-based switch/router of claim 39 wherein said means for dequeuing includes means for dequeuing packets from said VC-specific and class-specific queues according to a weighted fair algorithm.

41. The packet-based switch/router of claim 39 wherein said means for dequeuing includes means for dequeuing packets from said VC-specific and class-specific queues according to a strict priority algorithm.

42. The packet-based switch/router of claim 39 wherein said means for dequeuing includes means for dequeuing packets from said VC-specific and class-specific queues according to a weighted fair with strict priority algorithm.

43. The packet-based switch/router of claim 37 wherein said packet classifier reads header information from said packets to classify said packets.

44. The packet-based switch/router of claim 37 wherein said packet classifier reads layer 3 and layer 4 header information from said packets to classify said packets.

45. The packet-based switch/router of claim 37 wherein said means for enqueuing includes an enqueue module for enqueuing packets from multiple VCs and wherein said means for dequeuing includes a dequeue module for dequeuing packets from multiple VCs.

46. The packet-based switch/router of claim 37 wherein said means for enqueuing includes a VC-specific enqueue module for each VC and wherein said means for dequeuing includes a VC-specific dequeue module for each VC.

47. A packet-based switch/router comprising:

an input interface for receiving traffic on multiple virtual circuits (VCs);

an output interface for transmitting traffic on multiple VCs;

a packet classifier for classifying packets into traffic classes based on packet header information;

a demultiplexer for associating packets with a VC;

means for enqueuing said packets directly into VC-specific segmentation and re-assembly (SAR) queues if there is queue space available in said VC-specific SAR queues and if there are no packets in class-specific queues of the respective VCs or into said class-specific queues of the respective VCs if there is no queue space available in said VC-specific SAR queues.

48. The packet-based switch/router of claim 47 wherein said means for enqueuing further includes means for dropping packets if there is no queue space available in said VC-specific SAR queues or in said class-specific queues of the respective VCs.

49. The packet-based switch/router of claim 47 further including means for dequeuing packets from said class-specific queues to said VC-specific SAR queues as a function of traffic class when there is queue space available in said VC-specific SAR queues.

50. The packet-based switch/router of claim 49 wherein said means for enqueuing includes an enqueue module for enqueuing packets from multiple VCs and wherein said means for dequeuing includes a dequeue module for dequeuing packets from multiple VCs.

51. The packet-based switch/router of claim 49 wherein said means for enqueuing includes a VC-specific enqueue module for each VC and wherein said means for dequeuing includes a VC-specific dequeue module for each VC.

52. The packet-based switch/router of claim 49 wherein said means for dequeuing includes means for dequeuing packets from said class-specific queues according to a weighted fair algorithm.

53. The packet-based switch/router of claim 49 wherein said means for dequeuing includes means for dequeuing packets from said class-specific queues according to a strict priority algorithm.

54. The packet-based switch/router of claim 49 wherein said means for dequeuing includes means for dequeuing packets from said class-specific queues according to a weighted fair with strict priority algorithm.

55. The packet-based switch/router of claim 47 further including means for dequeuing packets from said VC-specific SAR queues for segmentation into fixed-length cells.

56. The packet-based switch/router of claim 55 wherein said means for dequeuing packets from said VC-specific SAR queues includes means for arbitrating among multiple VC-specific SAR queues.

57. The packet-based switch/router of claim 47 wherein said packet classifier reads header information from said packets to classify said packets.

58. The packet-based switch/router of claim 47 wherein said packet classifier reads layer 3 and layer 4 header information from said packets to classify said packets.